O. hispidus; it must, however, be observed that the species of this section of *Onthophilus* are very difficult to define, as, when in good condition, they are covered with minute spines and mud-like scales, and it is impossible to see the sculpture. As in the genus *Dastarcus*, the specific differences are very slight. All the hispid species are arboreal in habit; the specimens I have from Japan were residing in galleries of wood-borers, probably *Tomicus*, and were 8 or 10 inches from any orifice by which they could emerge. In Ceylon, I found *O. hispidus* in the same way, obtaining a large number in one tree; and M. Raffray, under similar conditions, found *O. costipennis* (also a hispid species) in the island of Zanzibar.

The locality for *O. arboreus* is the forest behind the large temple at Nara, in Hawatchi, where I took it in June 1881.

PROCEEDINGS OF LEARNED SOCIETIES.

DUBLIN MICROSCOPICAL CLUB.

February 15, 1883.

Magnetic Iron-Sand.—Dr. Frazer showed a specimen of magnetic iron-sand, of which the crystals were of brilliant adamantine lustre, and showed several modifications of the primary form; these displayed marked polarity when acted on by an artificial magnet, arranging themselves in bead-like strings.

Starch-granules (?) *remaining in the Ash of Platinotype Photographic Paper.*—Mr. Greenwood Pim showed a preparation of the ash of platinotype photographic paper after treatment with potass oxalate developer. Imbedded in the fibre of the paper were bright blue semitransparent bodies, somewhat rounded, and which dissolved in hot nitric and hydrochloric acids; but cold acid did not appear to produce much effect. They were considered to be a peculiar form of starch-granule in the sizing of the paper.

Nauplius-stage of Astacus.—Prof. Haddon showed the Nauplius-stage of *Astacus fluviatilis*, also the similar stage of a Cirripede for comparison.

Penium rufopellitum, Roy, *from Connemara, exhibited, to show the Exfoliation of the external reddish Cortical Coating.*—Mr. Archer showed examples from Connemara of *Penium rufopellitum*, Roy, a remarkable, if not very striking, Desmid. It is curious, as would seem, that this species has not been found out of the United King-

dom, one station being in Scotland, near Aberdeen, originally found by Mr. Roy; the other being at Connemara, and found by Mr. Archer. It probably most resembled *Penium cylindrus* (of which Mr. Archer now showed an example); but it is very distinct indeed. This form, *P. rufopellitum*, is of a brownish-red colour, due to an external roughish bark-like coating, which is occasionally shed from a portion of the superficies, the bare portion of the wall being then seen to be colourless. There does not seem to be any other species with this curious characteristic; the reddish colour and roughish granular superficies belonging to *Penium cylindrus* do not appear to be due to an outward coating capable of exfoliation.

March 15, 1883.

Vaucheria sessilis showing septation.—Dr. E. Perceval Wright exhibited some specimens, which had been some years mounted, of *Vaucheria sessilis*, showing the septation of this form, which was to be met with in the winter or early spring months. His object in doing so was to direct attention to Dr. M. C. Cooke's "Notes on *Vaucheria*" in the current (March) number of 'Grevillea,' in which he describes and figures septation of the filaments in a *Vaucheria*, stating that such had not been previously recognized. In a footnote Dr. Cooke remarks that the septation which he figures differs materially from that detailed by Stahl (Bot. Zeit. xxxvii. p. 129); but is this so? for the species described are not the same. Be this as it may, Hanstein, in 1872, has noticed the appearance of partition-walls in *Vaucheria*; and Schaarschmidt, judging from a short analysis of his paper, written in Hungarian in November 1882 ('Biologisches Centralblatt'), had also done the same. The specimens exhibited had been observed by Dr. Wright in 1879.

Echinobotryum atrum, Corda.—Mr. Greenwood Pim showed *Echinobotryum atrum*, Corda. This curious fungus is found parasitic on the stems of certain moulds, usually in this case *Stysanus* or *Pachnocybe*. It consists of groups of pear-shaped nearly black spores, resembling perithecia. It is referred to the Torulacei by Cooke, but its affinities with that group seem very doubtful. Something like mycelium was noticed in one or two instances. Possibly culture may reveal something more of its history. The present example appeared in abundance on the cut surface of an elm-branch at Monkstown.

Haliphysema Tumanowiczii new to Ireland.—Prof. Haddon showed *Haliphysema Tumanowiczii* from Dalkey Island, taken in 1882, the first recorded Irish example.

Cosmarium plicatum, Reinsch, *forma majus, from damp walls in a warm House at Glasnevin Botanic Garden.*—Prof. M'Nab showed some gelatinous stuff from the walls of one of the warm houses at Glasnevin Botanic Garden, formed by the confluent mucous

envelopes of Phycochromaceous Algæ, as frequently occurs on damp rocks in subalpine spots, but here rather unexpectedly showing imbedded certain *Cosmaria*. Prominent amongst these was the large and on the whole decidedly rare rock-form *Cosmarium plicatum*, Reinsch, forma *majus*. Doubtless under the name *Cosmarium plicatum*, Reinsch had in view two very distinct things, both indeed rare, although the smaller one is somewhat more frequently met with and usually in somewhat greater numbers than the "forma *majus*." This, the present one, occurs both in Ireland and Scotland, specimens from those wide-apart sources being absolutely identical.

Cosmarium acanthophorum, Nordstedt, *exhibited to show that the form appertains rather to Xanthidium*.—Mr. Archer showed the so-called *Cosmarium acanthophorum*, Nordstedt, also *Xanthidium Nordstedti*, Reinsch, showing how closely they approached one another, and expressing some wonder that Nordstedt should relegate such a form to *Cosmarium* at all, his name seeming to involve what might be almost regarded as a contradiction in terms as is expressed in the designation "spine-bearing *Cosmarium*."

Ammodiscus Scharmanni new to Ireland.—Mr. Balkwill, amongst many beautifully mounted Foraminifera, showed *Ammodiscus Scharmanni*, new to the Dublin fauna.

Air-bubbles in Water-cavities of Quartz.—Prof. Hartley showed some good and striking examples of air-bubbles in water-cavities of quartz.

April 19, 1883.

Specimens of Torrubia (Cordyceps) exhibited.—Mr. Pim showed one of the strange group of Sphæriaceous Fungi parasitic on insects, formerly called *Cordyceps*, now referred to *Torrubia*. The specimens were from the herbarium of Trinity College, and were identified by the Rev. M. J. Berkeley as *Torrubia (Cordyceps) Gunniæ*, natives of Van Diemen's Land, whence they had been sent to the late Professor Harvey. The sections showed very long slender sporidia having a seemingly chain-like structure, or like a number of dumb-bells ranged end to end. Further maceration in caustic potash resolved them into a series of transverse ridges across each sporidium, with small globules between each pair of ridges. The sporidia, though long, are extremely slender, so that it is very difficult to make out their structure. Specimens of *Torrubia Robertsii* from New Zealand were shown for comparison.

Microthamnion Kützingianum exhibited.—Mr. Crowe showed examples of that minute arborescent Alga *Microthamnion Kützingianum*, somewhat widely distributed, but always scantily represented and fitful in appearance. It forms an elegant very tiny little bushy tuft of bright green colour.

Budding in Polyzoa.—Prof. Haddon showed budding state of Polyzoa, illustrating late union of the lophophore with the stomach, and the origin of part of a bud from the endocyst and part from the funiculus.

Augite Crystal.—Prof. V. Ball exhibited a transverse section of an augite crystal from the Vesuvian lava of 1794. Under polarized light this is a very beautiful object, and exhibits striæ which mark the position of a plane of twinning. A photograph of it, magnified about 25 diameters, taken by Prof. G. F. Fitzgerald, represents this character, some included cells, and the structure of the matrix with admirable definition. The photograph was taken by electric light.

Foraminifera from the Vienna Basin.—Mr. Elcock showed a fine series of mounted (fossil) Foraminifera from the Vienna basin, remarking that many were identical with those from oceanic collections made during the expedition of H.M.S. 'Challenger,' in fact in no way distinguishable.

Alliospora sapuçayæ, Pim, *further phases.*—Mr. Pim drew attention to the fungus shown by him last year, and provisionally named *Alliospora sapuçayæ*. The description in the Club Minutes, though correct in so far as it went, proved on further investigation imperfect, inasmuch as the spore-bearing hyphæ do not originate, as was thought, directly from the globose columella, but from a layer of somewhat wedge-shaped closely packed cells forming an outer coat, whose thickness is twice or thrice the diameter of the columella. The sporiferous hyphæ, moreover, are frequently branched articulately at the tip, where spores are formed, as in the genus *Penicillium*.

May 24, 1883.

Pileolaria terebinthi exhibited.—Mr. Pim showed *Pileolaria terebinthi*, a native of Genoa, from specimens in the herbarium at Trinity College, Dublin. This curious rust is technically a *Uromyces*, but the lenticular spores with extremely long slender pedicels are abundantly distinct from any ordinary form of that genus.

Section of Stem of Lycopodium.—Prof. M'Nab exhibited a transverse section of the stem of a species of *Lycopodium*, probably *Lycopodium ilicifolium*, from a plant growing in the stove at Glasnevin. The central fibro-vascular cylinder presented a peculiar complicated appearance on account of its construction, the xylem and phloem being partly concentric, partly radial, according to the types of DeBary. The centre was concentric, whilst the periphery of the axile cylinder consisted of alternating radial bundles of xylem and phloem.

A problematic Organism.—Dr. E. P. Wright showed a mounted specimen of a peculiar and problematic organism which he had found in some quantity, quite incrusting the root-like portions

of one or two deep-sea alcyonarians. The specimens shown, though mounted dry, had been quite lately in strong spirit, into which they had, without doubt, been plunged on coming out of the sea. The organism, which was found in the form of thin, creeping, chain-like masses, consisted of a stoloniferous portion, from which arose a forest of trichome-like bodies all about the same length, and all terminating in a star of from five to six rays. These bodies, like the stoloniferous body-mass, were all formed of calcic carbonate, which, in spirit-specimens, seemed to be invested with a thin homogeneous plasmodic layer of a protoplasmic nature. While inclined to ascribe to this form Rhizopodal affinities, Dr. Wright found it quite impossible to do this with any certainty. With the crystal bodies in some Ascidians (in which these bodies form separate entities, and not, as here, part of a common mass) he fancied the exhibited specimens had nothing in common. The few remains of siliceous spicules entangled in the trichome-like bodies had obviously nothing to do with the strange but beautiful organism.

Spirotænia acuta, Hilse, *not strictly appertaining to the genus, though of similar habit.*—Mr. Archer showed some examples of a not uncommon, though local, unicellular Alga, doubtless that usually regarded as *Spirotænia acuta*, Hilse, but in which, in fact, he never could distinguish any trace whatever of a spiral arrangement of the chlorophyll-mass, so characteristic in *Spirotænia condensata*, *Sp. closteridea*, *Sp. truncata*, and *Sp. parvula*. No doubt the plant has the habit and the same kind of occurrence as those named, the young just-divided individuals hanging together in the same way in pairs in the sharply defined common investing mucous matrix. This plant, then, like *Spirotænia obscura*, so-called, he could hardly think was truly a *Spirotænia* at all, but approached more to *Penium*, the central axile (not parietal) mass of contents being only somewhat twisted.

June 22, 1883.

Fruit of Cliftonia.—Dr. E. Perceval Wright exhibited some mounted fragments of *Cliftonia pectinata*, Harv., which he had quite recently received from Baron F. von Müller, and which had been dredged by Prof. Bracebridge Wilson outside Port Phillip Head. These specimens showed ovate ceramidia, which were developed from the points of emergence of the pectinate ramelli of the frond. Harvey had never seen the species in fruit, but hazarded the conjecture that the ceramidia would prove to be, as in *Claudia*, formed out of contracted phyllodia; but it will be seen that the actual phenomenon is different from this, and adds one more to the characteristics of the genus *Cliftonia*. So far the tetrapores of this species remain undescribed.

Section of Ailsa Crag Rock.—Prof. Hull, F.R.S., exhibited a thin section of the rock of which Ailsa Crag, at the entrance to the Firth of Clyde, is formed. It is a grey felsitic rock, composed of crystals

of orthoclase, grains of quartz, a few needle-like crystals of hornblende, and a little chlorite, all of which are set in a felsite paste. With a high power the grains of quartz are seen to contain numerous gas-cavities, remarkable for their angular and crystalline forms; others contain a fluid, and show a small bubble. Prof. Hull explained the supposed origin of this remarkable rock, as having been the consolidated core of an ancient volcano, from which the loose materials, originally forming the sides of the volcanic cone, had been stripped off by denudation, thus leaving the solid core standing alone.

Staurastrum mesoleium, n. s., *exhibited*.—Mr. Archer drew attention to a *Staurastrum* form, which, though not quite peculiar to Callery Bog, seems to have its headquarters there. He had once or twice seen it from Connemara, and he suspected it may probably be the same as a form mentioned by Mr. Roy as having been found at Scorston Moor, near Aberdeen; but Mr. Archer had never seen examples from there. Mr. Roy had suspected his form, at any rate, to come near to *Staurastrum oligacanthum*, non Bréb., but as once understood by Herr Nordstedt; but the latter, as he since acknowledged, is wholly a different thing from *St. oligacanthum*, Bréb. (rare enough in Ireland), and he had proposed to name the Swedish form *Staurastrum mediolæve*. But the Callery form (and possibly, as mentioned, the Aberdeen form too) seems to be, indeed, altogether different from the Swedish form, now to be known as *St. mediolæve*, Nordstedt. The Callery form is a pretty one, about medium-sized, triangular in end view, in front view the angles a little produced, slightly spinulose. From its resemblance (albeit distant) to, and its association, for the time being, in our ideas, with the Swedish form (although neither name appears very appropriate), Mr. Archer would propose to designate the present form by the (companion) name *Staurastrum mesoleium*.

GEOLOGICAL SOCIETY.

December 19, 1883.—J. W. Hulke, Esq., F.R.S., President, in the Chair.

The following communication was read:—

"On some Remains of Fossil Fishes from the Yoredale Series at Leyburn in Wensleydale." By James W. Davis, Esq., F.G.S.

After describing the nature and succession of beds among the rocks which yielded the fossils under consideration, the author discussed the conditions under which they were deposited. He pointed out that the Fish-fauna of the Yoredale series was distinguished by some important peculiarities from that of the Mountain Limestone below, as also from that of the Coal-measures. Some of the Car-

boniferous-Limestone types are represented only by very small specimens in the Yoredale series; certain Coal-measure fish make their first appearance in these Yoredale beds; but a large proportion of the species in the latter are peculiar to the formation.

Of the thirty-four species cited twenty are identified with known Carboniferous-Limestone forms, namely:—*Cladacanthus paradoxus*, Ag.; *Physonemus hamatus*, Ag.; *Cladodus mucronatus* and *Hornei*, Davis, and *C. striatus*, Ag.; *Pristicladodus dentatus*, McC., and *concinnus*, Davis; *Glyphanodus tenuis*, Davis; *Petalodopsis tripartitus*, Davis; *Polyrhizodus Colei*, Davis; *Diclitodus scitulus*, Davis; *Petalodus acuminatus*, Ag.; *Pleurodus Woodi*, Davis; *Pœcilodus corrugatus*, Davis; *Lophodus reticulatus*, *serratus*, and *bifurcatus*, Davis; *Psammodus rugosus*, Ag.; *Copodus cornutus*, Ag.; and *Ctenopetalus crenatus*, Davis. The Coal-measure species, *Megalichthys Hibberti*, is also cited. The remaining thirteen species are described as new; they are:—*Chomatodus lamelliformis*, *Sandalodus minor*, *Lophodus conicus* and *angularis*, *Deltoptychius plicatus*, and the following, which are regarded as the types of new genera: *Gomphacanthus acutus*, *Hemicladodus unicuspidatus*, *Astrabodus expansus*, *Cyrtonodus gibbus*, *Echinodus paradoxus*, *Diplacodus bulboides*, *Mycetodus verrucosus*, and *Cercidognathus canaliculatus*.

In conclusion the author noticed the occurrence, associated with the above, of some very fragmentary remains, apparently belonging to a Labyrinthodont, a portion of which have already been described by Prof. Miall in the 'Quarterly Journal' (vol. xxx. p. 775). These remains consist of parts of the head and of one hind limb.

January 9, 1884.—J. W. Hulke, Esq., F.R.S., President, in the Chair.

The following communication was read:—

"On further Discoveries of Vertebrate Remains in the Triassic Strata of the South Coast of Devonshire, between Budleigh Salterton and Sidmouth." By A. T. Metcalfe, Esq., F.G.S.

The author gave a brief stratigraphical account of the Triassic rocks of the coast. He then described some vertebrate remains, consisting chiefly of portions of jaw-bones with teeth in line, probably of Labyrinthodonts, found in the Upper Sandstones (Ussher's classification) at High Peake Hill, near Sidmouth, by H. J. Carter, Esq., F.R.S. At numerous places between Budleigh Salterton and Sidmouth Mr. Carter and the author had found a large number of isolated bone fragments. Such fragments had been submitted to a microscopical examination by Mr. Carter. In some specimens the bone structure was visible throughout; in some the bony portion had been partially removed and replaced by an infiltration of mineral matter; in others the removal of the bony portion was complete. From these facts the author drew the conclusion that a comparative abundance of vertebrate life was maintained during the

Triassic period ; and that the rareness of Triassic fossils was due not so much to the paucity of animal life during that period as to the fact that Triassic strata afforded no suitable conditions for the *preservation* of organic remains.

MISCELLANEOUS.

On the so-called Dimorphism in the Genus Cambarus.

By Walter Faxon.

The existence of two forms of the adult male in all the species of the genus *Cambarus* was discovered by Louis Agassiz and Henry James Clark. The differences between the two forms affect more especially the first pair of abdominal appendages, organs concerned in the act of coition, but also extend to the general form and sculpture of the body. In one form (unhappily called by Dr. Hagen the "second form"), the first pair of abdominal appendages have a structure nearly like that seen in all *young* males. The hooks on the third joint of the third (in some species of the third and fourth) pair of legs are small, and in the sculpture of the shell and shape of the claws this form approaches the female. In the other form (Hagen's "first form"), the articulation near the base of the first pair of abdominal appendages is gone, and the whole member is much more highly specialized, the terminal hooks being horny, more widely separated, and in every way more highly developed; in those species with bifid tips to these appendages the branches are longer, slenderer, more widely separated, and stiffer; the hooks on the thoracic legs are longer and more perfectly finished ; the sculpture of the whole body is more pronounced, and the claws are larger and more powerful. No intermediate conditions are found, and there is no relation between these forms and the size of the individual, the "second form" being large and the "first form" small, or *vice versâ*. Hence we are forbidden to interpret the two forms as stages in ordinary development. Dr. Hagen has shown that in individuals of the "second form" the internal generative organs are smaller than in the "first form," but having only alcoholic material he was unable to determine any thing concerning the presence or absence of spermatozoa. He interprets the facts as a case of dimorphism, and surmises that the "second form" males are sterile individuals.

In the autumn of 1875 I received a lot of living *Cambarus rusticus*, Girard, from Kentucky, males of the "first form" and females, which bred freely in confinement. After pairing, three of the males moulted, and were thrown, while in the soft-shelled state, into alcohol, together with their exuviæ. An examination of these specimens now reveals the fact that the soft-shelled specimens are

all of the "second form," their exuviæ of the "first form"! After attaining the "first form" and after pairing the same individual has reverted to the "second form." It is now clear that we are not dealing with a case of true dimorphism, such as is well known among insects and plants, but it appears probable that the two forms of the crayfish are alternating periods in the life of the individual, the "first form" being assumed during the pairing-season, the "second form" during the intervals between the pairing-seasons. It is to be inferred that before the animal is again capable of reproduction another moult will bring it again into the "first form."

The fact that large collections, made at one time and place, often contain only one or a great preponderance of one form of the male is now explained.

I have also before me a male specimen of *Cambarus propinquus*, Girard, from Wisconsin, belonging to the Peabody Museum of Yale College, which was taken in the act of moulting. The old shell is "first form," the soft shell emerging from it is "second form."

It is remarkable that two forms of the male have not been detected in any other genus of crayfishes.

Fritz Müller ('Für Darwin') has pointed out the existence of two forms of the male in the genera *Tanais* and *Orchestia*, which he considers as truly dimorphic forms. It is possible that these are to be explained in the same way as the two forms of the male *Cambarus*.

Such a change as this connected with the reproductive period is unparalleled, so far as I know, among the Invertebrata, and even among the Vertebrata; the cases of partial atrophy of the generative organs or shedding of antlers (as in the stag) after the rut is over are hardly comparable.

At the time I had the specimens alive my attention had not been drawn to the questions relating to the two forms of the males, so that I failed to make anatomical examination, and the specimens have now lain too long in alcohol to be serviceable for internal dissection. I hope, however, that naturalists who are more favourably situated will be able to throw more light on this subject.

I will add that the males of extraordinary size which I have seen are all of the "first form." Do these very old individuals cease to moult? Do they become permanently capable of reproduction?—*Amer. Journ. Sci.*, January 1884, p. 42.

Museum of Comparative Zoology,
Cambridge, Mass.,
Nov. 12, 1883.

On Visual Organs in Solen. By Dr. B. Sharpe.

Dr. Benjamin Sharpe called attention to a remarkably primitive form of visual organ that he had discovered in the siphon of *Solen ensis* and *S. vagina* (the common "razor-shell").

His attention was directed to the probable possession of visual

organs by observing a number of these animals which were exposed in large basins for sale at Naples. A shadow cast by his hand caused the extended siphons of the specimens on which the shadow fell, instantly to retract, while those not in the shadow remained extended. Repeating this experiment at the Zoological Station at Naples, and being fully convinced that the retraction was due to the shadow and not to a slight jar which might have been the cause, he was led to examine the siphon more closely, and he also made a series of vertical sections for the purpose of very minute study.

When the siphon of a large *Solen* is cut open and examined, a number of fine blackish-brown lines or fine grooves are seen. These are situated between and at the base of the short tentacular processes of the external edge of the siphon. As many as fifty of these little grooves were found to be present in some specimens, and some of them were from 1 to 1·5 millim. in length.

When a vertical section is examined these pigmented grooves are distinctly seen, and the cells of which they are composed are very different from the ordinary epithelial cells which cover the more pigmented parts. These latter cells are ordinary columnar epithelial cells with a large nucleus which is situated near the *tunica* on which it rests. The pigmented cells are from one third to one half longer than those just described, and consist of three distinct parts. The upper part, or that part furthest from the *tunica*, appears perfectly transparent and takes up about one ninth or one tenth of the total length of the cell; this part is not at all affected with the colouring-matter used in colouring the whole. The second part of the cell is deeply pigmented and consequently opaque; it is filled with a dark brown or almost black granulated pigment; this takes up about one half of the length of the cell. Below this is the third part of this cell, consisting of a clear mass, which takes a slight tinge when coloured; this is probably the most active part of the cell; in this is imbedded the large oval nucleus. This nucleus is sharply demarcated and is filled with a granulated matter, which takes a dark colour in borax carmine, as do, indeed, the nuclei of all the epidermal cells.

These *retinal cells*, if they may be so called, are similar to those described by P. Fraisse in 1881 (Zeitschr. f. wiss. Zool., Bd. xxv.), in the very primitive eye of *Patella cærulea*, the principal difference being that in *Patella* the transparent part at the top of the cell seems to be a little more extensive. This eye of *Patella* is open, being merely an invaginated part of the epidermis, and has no lens. In *Haliotis tuberculata* we find an open eye also, but with the addition of a very primitive lens. The next higher grade of eye seems to be that of *Fissurella rosea*, in which the eye is closed and possesses also a lens; now in these two latter forms, where we find a lens present, the retinal cells do not possess the transparent ends we find in *Patella* and *Solen*, but the pigment fills the upper part of the cell quite to the top. This would indicate, he thinks, that the transparent part took the place of a lens.

No special nerve-fibres could be detected passing to these pigmented grooves. Nerves passing to the eye of *Patella* were also wanting; while, on the other hand, distinct veins were found passing to the eye of *Haliotis* and *Fissurella*.

He further stated that this power of distinguishing a shadow would be of great use to the animal in the struggle for existence. The *Solen* lies buried perpendicularly in the sand, and allows the siphon to project a little above the surface. This projecting part would, probably, frequently be bitten off by fishes, were it not for the fact that the shadow of the enemy would give warning, so that the siphon could be withdrawn in time to save it from destruction. —*Proc. Acad. Nat. Sci. Philad.*, Nov. 6, 1883, p. 248.

On a Nematode Parasitic on the Common Onion.

By M. Joannes Chatin.

It is well known that the parasitism of the Nematoda is exerted not only at the expense of animals, a certain number of these worms attacking various plants, in which they give rise to more or less serious alterations. The Anguillula of mildewed wheat has been very long known; an allied species, parasitic on the coffee-tree, has been studied by M. C. Jobert; and other worms belonging to the same group are observed in Dipsaceæ, Mosses, &c., as I took occasion to state in a communication dating some years back.

The worm which forms the subject of the present note lives as a parasite in the common onion (*Allium Cepa*, Linn.), and becomes in it the cause of a disease of which I have been able to trace the different phases, thanks to the extreme kindness of M. Pasteur, who sent me, in May 1881, a portion of a bulb infested by these Nematodes. I have been compelled to defer the publication of the results of my researches on account of the time necessary for tracing the development and the mode of propagation of the worm, appreciating exactly its vital resistance &c. Even now I shall confine myself to a summary of the principal points of its history; the anatomical and embryogenic details &c. must find a place in a more extended work.

By its general characters and especially the construction of its digestive tube, as also by the organization of its reproductive apparatus, the Anguillula of the onion must be classed in the great genus *Tylenchus*, and every thing authorizes our thinking that it represents a species distinct from those which have hitherto been described.

It is in the larval state that the worm penetrates into the bulb, which it attacks at the level of the "fundamental axis;" then it spreads into the roots and to the base of the flowering stem, generally respecting the external tissues, but completely disorganizing the central tissue, even getting into the fibro-vascular bundles and reducing them to a brownish pultaceous mass, in which nothing but a few fragments of spiral vessels is soon to be observed.

The Anguillula then attains its full development, the sexual organs, sketched out in the larva, rapidly complete their formation; fecundation takes place; and from the ova issue the young claviform larvæ, which are speedily set free by the disaggregation of the bulb. They creep about in the surrounding soil, that is, if the latter is sufficiently damp; in the contrary case they remain dried up and in a state of latent vitality, until the moment when favourable conditions permit them to revert to active life. On arriving in the neighbourhood of a normally developed *Allium* they penetrate into it, as above stated, and the cycle recommences.

In this way is explained how the same bulb contains at the same time adults, ova, and larvæ, and also how the parasite can be transmitted with the greatest facility from one plant to another, and how it is rapidly propagated through a whole plantation. As to the propagation through the floral organs &c., this is rare, the Anguillula only attaining them with difficulty, and this, indeed, precisely on account of the initial injuries which it causes in the bulb, and the effect of which is to arrest the development of the flowering-stem or to dry it up quickly.

The larvæ present a faculty of revivification analogous to that observed in the larvæ of the Anguillula of mildewed wheat; but it would seem that here this faculty is less powerful. I have, however, been able to ascertain it in larvæ preserved for twenty-six months in a dry well-corked bottle; beyond this period I have only obtained negative results. The adult Anguillulæ, subjected to desiccation, perish quickly, as is also the case when they are exposed to a cold of $-10°$ ($=14°$ F.), which has no action on the larvæ. Acidulated water and dilute alcohol instantly kill the adults, while the larvæ retain their vitality in them for some time.

These facts are obviously comparable to those observed in the case of the Anguillula of mildewed wheat, but the onion-parasite constantly manifests a smaller vital resistance. There is only one exception to be made in this particular:—M. Davaine has shown that the Anguillula of the mildewed wheat when introduced into the digestive canal of fishes, batrachians, and reptiles remains intact, whereas if the experiment be repeated with birds or Mammalia the worm is soon digested. Now the Anguillula of the onion does not undergo any alteration in this same medium, and is to be met with again, distinctly characterized, either in the dejections or in the contents of the intestine, if the animal has been killed shortly after the ingestion of portions of the plants containing the worms. One might thus be exposed to the error of regarding them as true parasites of the host into which they have been accidentally introduced, and in which they cannot acquire any development or undergo any encystation, as I have clearly ascertained.

The agents employed against the Anguillula of mildewed wheat may be used against the parasite of the onion; but the most efficacious process consists in pulling up the diseased plants and burning them.—*Comptes Rendus*, December 24, 1883, p. 1503.

Evidence of a Protozoëa Stage in Crab Development.

By H. W. Conn*.

There is great interest attached to speculations as to the probable ancestry of the Decapods, owing to the value which the conclusions have in enabling us to interpret palæontological facts. There have been quite a number of theories advanced as to the original stem from which the Decapods have been derived, two of which claim especial attention. One is the theory of Müller, who finds such a stem-form in the zoëa. Another, suggested by Claus, or in a different form by Brooks, considers the protozoëa as the ancestral stem. It is of great importance in understanding the Crustacea to decide between these two views, inasmuch as by the first view Crustacea are supposed to have descended from a form without a thorax, while according to the second, the thorax was present in the original Decapod stem. Some work done at Hampton during the last summer upon the larval cuticle of crabs indicates conclusively that the latter view is the correct one, or that at least Fritz Müller's view is incorrect. The larval skin, particularly the telson, of a large number of crab zoëas was studied with the following results:—The larval skin is not in different crabs alike, nor is it in any case exactly similar to the enclosed zoëa. There is always an indication, more or less complete, of some previously existing stage. There has been shown in the various forms studied a gradation from the larval skin, with little difference from the zoëa enclosed, to a larval skin which is utterly unlike the zoëa, but which possesses a forked tail with fourteen long feathered spines. This gradation is complete, and a study of the different embryonic telsons shows that all have been derived from the form shown by *Panopeus*, which has a forked tail with fourteen spines. Now such a larval skin is to be considered simply as the cast-off skin of some stage immediately preceding the zoëa. It has been shown by Paul Meyer that the study of the larval skin of Macrura leads to a similar result; that a forked tail with fourteen spines is also seen in the early history of this group. If therefore a form can be found which shows these peculiarities, we have reason for accepting it as the stem-form of the higher Crustacea. Now a study of the different protozoëa-forms which occur in the ontogeny of various Macrura shows that we have in this form a stage which fulfils the conditions. It has the forked tail with fourteen spines, and has large swimming antennæ, another peculiar characteristic of the crab larval cuticle. If the various larval skins of crabs and Macrura be compared with each other, it will be seen that they are all to be considered as modifications of a tail much like that present in the larval skin of *Panopeus*; and if this tail be compared with the protozoëa-tail of *Peneus*, the likeness will be seen to be very striking. We have therefore, in the comparative study of the larval cuticle of crabs, good reason for accepting as the stem-form of the Decapods a form which had resemblance to a protozoëa.—*Johns Hopkins University Circulars*, Jan. 1884, p. 41.

* Abstract of a communication to the University Scientific Association, November 7, 1883.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[FIFTH SERIES.]

No. 75. MARCH 1884.

XVIII.—*On* Grantia ciliata, *var.* spinispiculum, *Crtr.*

By H. J. Carter, F.R.S. &c.

[Plate VIII.]

Having lately (September 1883) had occasion to collect a few of the Calcispongiæ which grow upon the rocks and seaweed about this place (Budleigh-Salterton, South Devon), I found it necessary to refer to Dr. Bowerbank's 'Monograph of the British Spongiadæ' to ascertain if I had among them any specimens of the *Grantia ciliata* illustrated in his third vol. (pl. ii. figs. 1–15), which appears to me to be typically that described and illustrated by Dr. Johnston in his 'History of British Sponges' (p. 176, pl. xx. fig. 4, and pl. xxi. figs. 6 and 7). Of this the type specimen is in the Johnstonian collection in the British Museum (no. 30, registered 47. 9. 7. 79), evidencing Montagu's remark respecting this sponge, which Johnston has quoted, viz. "that the specific character of being 'surrounded at top by a crown of spines' is rarely identified" (*op. et loc. cit.*). This is also shown in Dr. Bowerbank's illustration (*op. et loc. cit.* pl. ii. figs. 1 and 3); but in his description of this species (*op. cit.* vol. ii. p. 24) he refers for further particulars to his first paper on "The Organization of *Grantia ciliata*," viz. that in the 'Transac-

tions of the Microscopical Society' (vol. vii. p. 79, pl. v.), where the illustrations of the *entire* sponge (figs. 1 and 2) are quite different from those in the third volume of his 'Monograph.'

These differences were observed by Häckel in 1870, when he made two species of them under the name of *Sycandra ciliata* for the former and *S. coronata* for the latter ('Die Kalkschwämme,' vol. ii. pp. 296 and 304, and 'Atlas,' Taf. li. and lviii. and Taf. li. and lx.). But it does not seem to have influenced Dr Bowerbank in 1874, although the Rev. A. M. Norman, who edited the posthumous volume of his work (vol. iv., 1882), adopts the separation (p. 230).

However, after carefully reading and comparing Häckel's description of *Sycandra* (*Grantia*) *ciliata*, *S. coronata*, and *S. raphanus* respectively (vol. ii. p. 296 *et seq.*), together with the specimens of the two former found here, it appears to me that they run into each other in such a way that, although there may be grounds for making a separate species of the latter, I, with the late Dr. Bowerbank, see none for separating specifically the two former. The differences that exist between *Sycandra ciliata* and *S. coronata* appear to me to arise chiefly from the circumstances under which they have grown, viz. whether this has taken place in strong currents or comparatively still water, which, on account of the extreme brittleness and delicacy of the finer and longer spicules on the surface of the body, leads to their being more or less broken off. If these spicules have been retained entire, they are generally so matted together in the dried specimen as to obscure the conuli from which they proceed and thus give the surface of the body a shaggy ("zottig," H.) character; while those of the peristome or mouth may be more or less worn away, thus corresponding with Johnston's type specimen, Dr. Bowerbank's illustrations (vol. iii. *l. c.*), and my own experience here; but if, on the other hand, the finer and longer spicules of the conuli have been broken off, while the shorter and stouter ones which succeed them inwards remain, which is generally the case, then the conuli will of course be exposed, and the peristome remaining intact, we shall get a specimen like that represented by Dr. Bowerbank in the 'Transactions of the Microscopical Society' (*l. c.*), the former being Häckel's *Sycandra ciliata* and the latter his *S. coronata*. As to specific differences being deduced from the measurements of spicules and even the entire forms themselves of sponges, these are so variable generally that it is only here and there that they afford any trustworthy evidence.

But there is a difference in structure between *Sycandra*

ciliata and *S. coronata* on the one hand and *S. raphanus* on the other, which may, if constant, claim specific distinction for the latter; I allude to the prismatic form of the radial chambers in *S. raphanus*, whose transverse section made longitudinally to the body, midway between the surface of the cloaca and the conuli, presents a *hexagonal* arrangement with triangular spaces between the hexagons, first noticed by Häckel in his synoptical table of these sponges (*op. cit.* vol. ii. p. 294), while in *Sycandra ciliata* and *S. coronata* a similar section shows the chambers to be *circular* or cylindrical. How far this is sufficiently persistent to justify specific separation I am not prepared to state.

Carefully comparing Häckel's description of *Sycandra raphanus* with the species that prevails here, which in all respects agrees with that from the north of Shetland which I have named "*Grantia ciliata*, var. *spinispiculum*" ("Sponges dredged on board H.M.S. 'Porcupine,'" 'Annals,' 1876, vol. xviii. p. 468, pl. xii. figs. 6 and 7), I can see no difference between the two except in the presence of the spiniferous spicules in the latter, to which I shall presently allude, but which Häckel does not notice *at all* either in his descriptions or illustrations, although F. E. Schulze a few years later illustrated and described them particularly in *Sycandra raphanus* (Zeitschrift f. wiss. Zoologie, 1875, Bd. xxv. 3es Suppl. pp. 254 and 255, Taf. xix. fig. 1, *a–d*).

Now the fact of such spinous spicules having been found in *Sycandra raphanus* compared with their presence here in *Grantia spinispiculum*, whose structure otherwise corresponds exactly with Häckel's description of the former, leads me to infer that *Grantia spinispiculum* and *Sycandra raphanus* are the same, while the prismatic form of their radial chambers (and, perhaps, the spiniferous spicules) alone distinguishes them from *Sycandra ciliata* and *S. coronata*. It is the identity or not of the two former which I wish to be confirmed, as I do not possess a type specimen of *Sycandra raphanus* from the Adriatic for comparison; and therefore shall give hereafter an illustrated description of *Grantia ciliata*, var. *spinispiculum*, in all its principal detail, not only for this purpose, but to illustrate the variety itself, which hitherto has not been done.

In alluding to the acerate spicules which form the outer layer of the "collar-ring" noticed by Lieberkühn in "*Grantia ciliata* sive *Sycon ciliatum*" (Archiv f. Anat. u. Physiologie, July 1859, Heft iii. p. 373), and subsequently by Bowerbank (Trans. Microscop. Soc. *l. c.* p. 82), Häckel observes (*op. cit.* vol. ii. p. 308) that they are not to be found in *Grantia*

ciliata (" bei *S. ciliata* fehlen "), which I fancy must be a mistake, as from microscopical examination of specimens now before me I must agree with Lieberkühn and Bowerbank in affirming that the collar-ring (" Halsring," H.) in all three (that is including *S. raphanus*) commences where the conuli on the surface *outside*, and therefore the oscules of the radial chambers on the surface of the cloaca *inside*, cease and ends where the corona proper or circle of long, straight, setaceous, simple spicules commences (Pl. VIII. fig. 2, *h*), and that this layer of comparatively thick acerate spicules externally may be more or less present, according to the wear and tear above noticed to which the specimens may have been subjected. How far we may be justified in identifying with *Sycandra raphanus* the specimens of *Grantia ciliata*, var. *spinispiculum*, which I have lately found here, the following illustrated description, as above suggested, may determine.

Grantia ciliata, var. *spinispiculum*. (Pl. VIII. figs. 1–8.)

Pyriform elongated, fixed by the small end to the object on which it may be growing, terminated at the large or free end by an asbestine glistening pencil of long straight spicules; conulated over the surface, which is also ciliated with fine long spicules, inclined forwards and often presenting an asbestine sheen, like that of the pencil of spicules at the free end; more or less inflated and bent upon itself, often dividing into two heads, that is bigeminate (Pl. VIII. figs. 1 and 2). Colourless or transparent white. Consistence fragile. Surface uniformly covered with conical processes in juxtaposition (fig. 2, *a a a*), whose framework is composed of triradiate spicules, terminating towards the point of the cone in a slightly extended ray, which, intermingling with a bunch of linear spicules consisting of *fifty or more* of variable length, altogether forms the ciliary covering of the body just mentioned. " Bunch of linear spicules " composed of six forms, viz. :—1, extremely slender, almost immeasurably thin, straight, smooth, almost imperceptibly tapering outwards from an equally slight enlargement of the proximal end, in shape something like knitting-needles (" Stricknadeln," H.), in bundles scantily dispersed among the larger acerates, variable in length, averaging perhaps about 1-85th inch long, but seldom found entire from their delicacy. 2, short, fusiform, slightly curved and spined over one or both sides of the distal portion, which is terminated by a short smooth spur turned in the opposite direction, varying in length about 1-461st of an inch, which is that of the shortest observed (fig. 3, *c*). 3,